

What is claimed is:

1. A method for trimming photoresist features on a semiconductor substrate in a plasma processing system, comprising:
 - placing a substrate with a patterned photoresist layer having at least one element with a first prescribed width on the substrate in the plasma processing system;
 - supplying to the process chamber a process gas mixture comprising a hydrocarbon gas, an oxygen gas, and an inert gas; and
 - disassociating the process gas mixture to etch the patterned photoresist layer.
2. The method of claim 1 further comprising:
 - terminating the etch process to leave the patterned photoresist layer with at least one element with a second prescribed width on the substrate.
3. The method of claim 1 wherein the hydrocarbon gas is either halogenated or non-halogenated, or a combination thereof.
4. The method of claim 3 wherein the halogenated hydrocarbon gas is CHF_3 .
5. The method of claim 3 wherein the non-halogenated hydrocarbon gas is CH_4 .
6. The method of claim 1 wherein the flow rate of the hydrocarbon gas is between about 20 sccm to about 400 sccm and the flow rate ratio of hydrocarbon gas to oxygen gas is between about 1 to about 20.
7. The method of claim 1 wherein the oxygen flow rate is between about 5 sccm to about 100 sccm.
8. The method of claim 1 wherein the inert gas is Argon.

9. The method of claim 8 wherein flow rate of the inert gas is between about 20 sccm to about 400 sccm and the flow rate ratio of inert gas to oxygen gas is between about 1 to about 20.
10. The method of claim 1 wherein the process pressure is between about 2 mTorr to about 50 mTorr.
11. The method of claim 1 wherein the source power is between 200 watts to 1500 watts.
12. The method of claim 1 wherein the bias power is between 0 watts to 400 watts.
13. The method of claim 1 wherein the substrate has a patterned photoresist layer having patterns of dense regions and isolated regions.
14. The method of claim 13 wherein the pattern density of the dense region is greater than 20%.
15. The method of claim 13 wherein the pattern density of the isolated region is less than 10%.
16. The method of claim 13 wherein the etch rates of the dense regions and the isolated regions are controlled by the ratio of hydrocarbon gas to oxygen gas.
17. The method of claim 13 wherein the etch rate ratios of the dense regions and the isolated regions are controlled by the ratio of hydrocarbon gas to oxygen gas.